

## VIEWPOINT



# The evolution of culture (or the lack thereof): mapping the conceptual space

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**Abstract.** This short essay is based on a lecture that I gave at short notice on a subject in which I am by no means an expert. The combination of lack of expertise and time for preparation, created an unexpectedly unique opportunity for thinking outside the box. I decided not to try to read up (as there was no time in any case) but instead to organize the little that I already knew about cultural evolution in a systematic schema—I attempted to create a scaffolding, on which I could hang everything I knew about cultural evolution, and hopefully, everything I might ever discover about cultural evolution in the future. I considered three dimensions of the study of cultural evolution, namely (i) the phenomenon of cultural evolution, (ii) production of knowledge in the field of cultural evolution, and (iii) the consequences or applications of an understanding of the evolution of culture.

**Keywords.** cultural evolution; extended phenotype; conceptions of culture; biological evolution; genetic predisposition.

## The phenomenon of cultural evolution

Culture is generally understood to mean the sum total of experiences, attitudes and behaviours, not entirely biological, not instinctive and not genetically inherited. Instead, culture is acquired and learned, and also transmitted both vertically (across generations) and horizontally (across members of the same generation). Richard Dawkins coined the term ‘meme’ (Dawkins 1976) to represent a unit of culture analogous to the term gene, a unit of heredity. There are four possible conceptions of culture.

### *No culture, just an extended phenotype*

In this conception, there is no need to recognize a separate category called culture. What we perceive as culture is really an extended phenotype and therefore, ultimately the product of genes. Thus all culture is ultimately tethered to genes, however, remotely. The phrase, extended phenotype, was introduced by Richard Dawkins who famously described the burrows of worms and nests of birds as extended phenotypes (Dawkins 1982). It is true that culture in humans is far more complicated than burrows of worms and nests of birds, but then, so is the human kidney as compared to the excretory vacuoles in an amoeba. If vacuoles in amoebae can eventually be replaced by kidneys in humans then why cannot biofilms in bacteria (they

are extended phenotype) be replaced eventually by drones used in today’s warfare (our extended phenotype)? One great advantage of this attitude is that it automatically unifies the study of biology and culture. Such a priori unification of the study of biology and culture may be a great advantage in the study of worms and birds for example. And the experience of a unified study of biology and culture in animals may eventually be an equally great advantage in the study of human culture. At the very least, I think at least some of us should persist with this attitude and see how far we can go with it. Perhaps it would be a long while before we are forced to abandon it. Only such persistence will let us discover the limits of such a conception of culture.

### *There is culture but no evolution*

In this conception, culture is recognized as an entity distinct from biological phenotypes. However, culture does not evolve in the same sense as biological phenotypes do. This means, of course that each culture is the singularity; no general laws can be discovered, no explanations can be offered and no predictions can be made. In other words, as Richard Lewontin and colleagues have argued, we can only provide nomological explanations (explanations that are neither logically necessary nor theoretically explicable) of

culture but not historical ones (Lewontin *et al.* 1984). For most biologists this attitude toward culture seems demonstrably wrong. Nevertheless, it is an attitude that is quite common among nonbiologists; it is perhaps the norm in the humanities. It is my argument, familiar by now, that however absurd it may seem to us, we should not suppress attempts to persist with this attitude and take it to its logical conclusion. If and when it fails, not only its failure but also the nature and extent of its failure would be a valuable lesson learned at least for some of us, if not for the original custodians of this attitude.

*Culture evolves by a process analogous to but independent of biological/genetic evolution*

In this conception, perhaps the most widespread, there is culture and it evolves (changes by discernible rules, not nomological) but independent of biological evolution by natural selection. Fashions, clothing, music, smoking, drug (ab)use are the most favourite examples that are used to promote this point of view. Meme is a useful metaphor but it is emphasized that memes are analogous to genes, not identical to genes. Evolution requires interindividual transmission and cultural traits (memes) can transmit through well defined rules, and can transmit both vertically (down the generations) and also horizontally (between individuals of the same generation). This is made possible because transmission is not through biological inheritance but by copying, imitation, teaching, learning, proselytising and coercion. Rates of transmission can be rationalized and even predicted by logic similar to that used for biological evolution. One can imagine cost and benefits of adopting cultural traits and one can even think of ‘adaptation’ and increase in a version of fitness in the form of social prestige. Such fitness can make some individuals in turn better transmitters of the said trait or even of other unrelated traits—individuals can gain social prestige by successfully adopting one cultural trait, e.g. style of dressing or style of acting in theatre or cinema and become brand ambassadors for an unrelated trait such as a brand of smart phones for example. The important points are that culture evolves and we can develop a theory of cultural evolution without invoking biological inheritance or even biology itself.

*Cultural evolution IS biological evolution*

In this fourth and final conception, there is culture and it evolves by principles identical to biological evolution. There are close interactions between biological and cultural traits, between genes and culture. Genetic predispositions influence which cultural traits are adopted and spread. Culture can similarly feedback and significantly influence the spread of genes. There is gene-culture coevolution, indeed never a total independence between

genes and culture. The coevolution of lactose tolerance and dairy farming in humans is a classic well-studied example that illustrates the principles behind this conception. Lactose tolerance and intolerance are determined by allelic variations in genes involved in producing lactase, the enzyme needed to digest milk. There is clear empirical evidence for a correlation between lactose tolerance and history of dairy farming across the globe. Typical population model of the kind used to model the spread of genes are able to account for the observed geographical and cultural variability in the distribution of lactose tolerance (Cavalli-Sforza and Feldman 1981; Boyd and Richerson 1985; Durham 1991; Feldman and Laland 1996). The most important difference between ‘no culture’ and ‘cultural evolution is biological evolution’ is that in the later conception genes and culture feedback on each other and thus influence each other, often in an imperfect manner.

**Production of knowledge**

It is easy to see that the mode of knowledge production, the theoretical and empirical strategies of investigation and even the goals of study can vary widely depending on which conception of culture one subscribes to. If one subscribes to the conception of ‘no culture—just biology’ then there is really nothing special to be studied. Anything that anyone might want to call culture is just an (extended) phenotype and will get automatically included in the biological investigation. In the extreme case of there being evidence for transmission of the extended phenotype across generations, then one simply adds cultural inheritance as one more mode of inheritance. This kind of ‘pure biology’ view is more prevalent than readers of the literature and even producers of the literature might realize. This is not to deny culture but decide not to make any special pleading for it. If one takes the position instead that there is culture but it does not evolve then one argues that culture just happens and one does ‘old fashioned’ history. Of course, one can make it sound modern by adding archaeology and palaeontology and even radio-isotope dating but the point is that one does not even attempt to infer general laws. Indeed, one does not try to explain let alone predict anything. Nevertheless, one can derive great pleasure and learn a great deal by dwelling in an ocean of singularities. If one believes that culture evolves but independent of biological evolution then one can stray more closely into the realm of genetics and evolutionary biology but only by imitation. One can mimic models of biological evolution, use game theory and build into models suitable kinds of transmission mechanisms. One can, e.g., build a sophisticated model to understand why certain habits such as wearing hats can spread and other habits such as keeping streets clean may not spread. One can investigate the dynamics of

the penetrance of Microsoft computers versus Apple computers and so on. There is no real biology or gene based natural selection here. If one is in the realm of cultural evolution as biological evolution then one plays a very different game. One builds coevolutionary models involving genes and culture, one maps gene frequency changes and meme frequency changes onto each other, one measures the strength of selection for genes and memes and one asks whether genes are holding back memes on a leash or the other way around. In short, one continues to do population genetic modelling except that the models now become more complicated because they also include cultural traits which are semi-independent of genes.

### My claim

It is my claim that all the above mentioned four conceptions of culture are (i) logically viable, (ii) they are both necessary and sufficient, (iii) they occupy the entire imaginable conceptual landscape and (iv) everything that we know today or may discover tomorrow can be mapped onto one or more of them. More than ruling out the possibility that this conceptual landscape will prove insufficient, my real claim is that making a discovery that demonstrates the inadequacy of the conceptual space encompassed by this landscape, would constitute a true revolution in the study of culture.

### Consequences of culture

No matter which conception of culture one subscribes to, three fundamental consequences of culture are evident, and yet rather poorly understood. The first is that the number of offspring is no longer an adequate currency of fitness. This may simply mean that quality of offspring is more important than quantity. Building a nest may increase hatchling survival in a bird and amassing wealth or even social prestige by parents may do the same for human offspring. But it is not clear whether this is the entire story. Even more interesting is the possibility that culture can directly increase the probability that people have children. I recently read the novel 'One part woman' set in a small town in preindependence southern India (Murugan 2014). The novel describes in vivid and moving detail, the harassment and ignominy that childless parents (due to an impotent man or a barren woman) are subjected to by family, neighbours and everybody else. I cannot imagine that parents who are biologically fit to have children will ever voluntarily refrain from having them in that cultural environment.

The second consequence is that culture can make us maladapted to the current environment. When a cultural practice originated it might have been useful, i.e. contributed to fitness but later, as the environment changed, it

may become neutral or even harmful. Many important paradigms of study such as the hygiene hypothesis are based on such an assumption. The anthropological literature is replete with explanations based on the idea that we evolved in a different environment, hence our craving for salt and sugar and fat for example. And yet this idea has been poorly investigated—when can we invoke this idea, what is the proof that we evolved in a different environment—there is a lot of hand waving and insufficient rigorous investigation.

Finally, and most controversially, culture, especially medicine and technology can potentially allow deleterious alleles to survive. This dangerous idea in the garb of mutation load and eugenics has been so misused in the past that the very investigation of whether and to what extent culture permits the survival of deleterious genes is difficult to know. Is there some way to study this without the dangers of encouraging or facilitating social engineering? Perhaps we should work with plants.

### My recommendation

It is my recommendation that all the above mentioned four conceptions of culture should be allowed to be pursued to their logical conclusion by their respective passionate adherents. No attempt should be made to scuttle any of these trajectories of thought and research in the name of peer-review. Given the way modern science works, this is hard to achieve. The only viable option in similar situations elsewhere has been the isolation (speciation) of adherents of different conceptions into noninteracting, mutually critical communities. Unfortunate, as it will be, this solution is better than forced extinction of some of them by the others.

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